Barge Particulars

Length	$L =$	**100.00**	***m***
Breath	$B =$	**40.00**	***m***
Draft	$T =$	**5.00**	***m***
Towing speed	$V_{tow} =$	**2.00**	***knots***

Windage Area

Hull (surface above waterline)	$S_{wind\text{-}hull} =$	**100.00**	m^2
Shape coeffiecient	$C_s =$	**1.00**	
Height coefficient	$C_h =$	**1.00**	
Additional surface of Cargo	$S_{wind\text{-}additional} =$	**200.00**	m^2
Shape coeffiecient	$C_s =$	**1.00**	
Height coefficient	$C_h =$	**1.00**	
Hull+Cargo windage area	$Area_{wind} =$	**300.00**	m^2

Current Area

Surface	$S_{current} =$	**200.00**	m^2
Drag coefficient		**0.40**	
Current screen	$Area_{current} =$	**80.00**	m^2

Environmental Condition

Sea water density	$\rho_{water} =$	**1025**	kg/m^3
Air density	$\rho_{air} =$	**1.29**	kg/m^3
Wave significant height	$H_s =$	**3.00**	***m***
Wind speed	$V_{wind} =$	**20.00**	***knots***
Current speed	$V_{current} =$	**2.00**	***knots***

Wave drift force

$$F_{drift} = \frac{H_s^2 . B . (0.52L - 13)}{L.g} = \textbf{14.31}\ \textit{Tons}$$

Resistance due to towing in calm water **4.67** ***Tons***

Additional resistance due to wind and current **15.78** ***Tons***

TOTAL BARGE RESISTANCE = **34.76** ***Tons***

Tug boat efficiency **0.75**

TUG BOAT BOLLARD PULL CAPACITY = **46.34** ***Tons***